CLAIMS

What is claimed is:

1. A method of detecting linear operation in a power amplifier, the power amplifier being operative to amplify an input signal for transmission, the method comprising the steps of:

detecting the output signal of the power amplifier, the output signal having been modulated with a base band signal;

converting the detected output signal into a digital signal;

comparing the envelope of the detected and converted output signal to the envelope of the base band signal; and

decreasing the input power level of the input signal if the difference between the envelope of the detected and converted output signal and the envelope of the base band signal is beyond a first threshold level.

2. The method of claim 1, further comprising the step of time aligning the detected and converted output signal with the base band signal.

3. The method of claim 1, wherein the input signal is provided to the power amplifier through a variable gain amplifier, and the step of decreasing the input power level of the input signal comprises decreasing the gain of the variable gain amplifier.

4. The method of claim 1, further comprising the step of increasing the input power level of the input signal if the difference between the envelope of the detected and converted signal and the envelope of the base band signal is not beyond a second threshold level.

5. The method of claim 1, further comprising the step of maintaining the input power level of the input signal if the difference between the envelope of the detected and converted signal and the envelope of the base band signal is between the second threshold level and the first threshold level.

6. A circuit for maintaining linear operation of a power amplifier, the circuit comprising the components of:

a power amplifier, a variable gain amplifier, a coupler, a voltage detector, and a processor,

the power amplifier having a signal input and a signal output;

the variable gain amplifier having a signal input, a signal output, and a control input, the signal output of the variable gain amplifier being electrically coupled to the signal

input of the power amplifier, the signal input of the variable gain amplifier receiving a modulated signal that has been modulated with a base band signal, the control input of the variable gain amplifier being connected to a first control output of the processor,

the coupler being electrically coupled to the signal output of the power amplifier and operative, in cooperation with the voltage detector, to detect the envelope of an output signal at the signal output of the power amplifier and provide the detected envelope to a detected signal input of the processor;

the processor, being operative to:

receive the detected signal input and compare the detected signal input to the base band signal;

adjust the first control output of the processor to limit the gain of the variable gain amplifier if the detected signal input is beyond a first threshold level in comparison with the base band signal.

7. The circuit of claim 6, wherein if the detected signal input is within a second threshold level in comparison with the base band signal and the output power is below a target threshold, the processor is further operative to adjust the first control output of the processor to increase the gain of the variable gain amplifier.

8. The circuit of claim 7, wherein if the detected signal input is between the first threshold level and the second threshold level in comparison with the base band signal, the processor is further operative to maintain the value of the first control output of the processor and thereby maintain the gain of the variable gain amplifier.

9. The circuit of claim 6, wherein if the detected signal input is within the first threshold level in comparison with the base band signal, the processor is further operative to maintain the value of the first control output of the processor and thereby maintain the gain of the variable gain amplifier.

10. The circuit of claim 6, wherein the power amplifier further includes a control input and the processor further includes a second control output that is electrically coupled to the control input of the power amplifier and initially set to a normal value and, if the detected signal input is beyond of the first threshold level, the processor is further operative to adjust the second control output to change the bias of the power amplifier to improve the linearity and, if the detected signal input is within a second threshold level, to adjust the second control output to change the bias of the power amplifier towards the normal value if the bias of the power amplifier has been previous changed.

11. A mobile station for use in a cellular system, the mobile station comprising:

a power amplifier having a signal input received from a variable gain amplifier and a signal output for transmitting through an antenna;

a voltage detector coupled to the output of the power amplifier for detecting the output signal and obtaining a detected signal output;

an analog to digital converter electrically coupled to the output of the voltage detector for receiving the detected signal and for converting the detected signal from analog to a digital signal and providing the digital signal to a digital output;

a processor coupled to the digital output of the analog to digital converter for receiving the digital signal, the processor being operative to:

receive a base band signal originally used to modulate the detected output signal;

correlate the base band signal with the digital signal;

compare the envelope of the base band signal with the digital signal; and

adjust the gain of the variable gain amplifier in accordance with the results of the comparison.

12. The mobile station of claim 11, wherein the processor is operative to adjust the gain of the variable gain amplifier by decreasing the gain if the comparison is beyond a maximum threshold of difference.

13. The mobile station of claim 12, wherein the processor is further operative to adjust the gain of the variable gain amplifier by increasing the gain if the comparison is within a minimum threshold difference.

14. The mobile station of claim 13, wherein the processor is further operative to maintain the gain of the variable gain amplifier if the comparison is between the minimum threshold and the maximum threshold difference.

15. The mobile station of claim 11, further comprising a temperature sensor and, the processor is further operative to adjust the gain of the variable gain amplifier in accordance with the comparison and the temperature reading of the sensor.

16. The mobile station of claim 15, further comprising a voltage sensor for measuring the voltage level of a source providing power to the mobile station and, the processor is further operative to adjust the gain of the variable gain amplifier in accordance

with the comparison, the temperature reading of the sensor and the level reading of the voltage sensor.

17. The mobile station of claim 16, further comprising a reverse power detector for detecting a voltage standing wave ratio and, the processor is further operative to adjust the gain of the variable gain amplifier in accordance with the comparison, the temperature reading of the sensor, the level reading of the voltage sensor and the voltage standing wave ratio.

18. The mobile station of claim 11, further comprising a voltage sensor for measuring the voltage level of a source providing power to the mobile station and, the processor is further operative to adjust the gain of the variable gain amplifier in accordance with the comparison and the level reading of the voltage sensor.

19. The mobile station of claim 11, further comprising a reverse power detector for detecting a voltage standing wave ratio and, the processor is further operative to adjust the gain of the variable gain amplifier in accordance with the value of the comparison and the voltage standing wave ratio.

20. The mobile station of claim 11, wherein the base band signal is correlated with the digital signal by compensating for timing shift and the amplitude scaling.